

**U.S. DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
(formerly National Bureau of Standards)**

**COMMERCIAL STANDARD CS251-63
HARDBOARD**

CS251-63, Hardboard, superseded by Product Standard PS58-73, Basic Hardboard was withdrawn by the U.S. Department of Commerce in January 1982.

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The following standard was used: American National Standard Institute/American Hardboard Association (ANSI/AHA 135.4, Basic Hardboard).

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COMMERCIAL STANDARD CS251-63

WITHDRAWN

Reprinted April 1967 with Amendments

HARDBOARD

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A recorded
voluntary standard of the
trade published by
the U.S. Department
of Commerce



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U.S. DEPARTMENT OF COMMERCE
Alexander B. Trowbridge, Acting Secretary

NATIONAL BUREAU OF STANDARDS

A. V. Astin, Director

Office of Engineering Standards Services

With the cooperation of the
Forest Products Laboratory,
Forest Service,
U.S. Department of Agriculture.

EFFECTIVE DATE

Having been passed through the regular procedures of the Office of Commodity Standards (now the Office of Engineering Standards Services, National Bureau of Standards) and approved by the acceptors hereinafter listed, this Commercial Standard is reissued by the National Bureau of Standards, effective February 11, 1963, as amended November 15, 1966.

A. V. ASTIN, *Director*.

COMMERCIAL STANDARDS

Commercial Standards (now called Product Standards) are developed by manufacturers, distributors, and users in cooperation with the Office of Engineering Standards Services of the National Bureau of Standards. Their purpose is to establish quality criteria, standard methods of testing, rating, certification, and labeling of manufactured commodities, and to provide uniform bases for fair competition.

The adoption and use of a Commercial Standard is voluntary. However, when reference to a Commercial Standard is made in contracts, labels, invoices, or advertising literature, the provisions of the standard are enforceable through usual legal channels as a part of the sales contract.

Commercial Standards originate with the proponent industry. The sponsors may be manufacturers, distributors, or users of the specific product. One of these three elements of industry submits to the Office of Engineering Standards Services the necessary data to be used as the basis for developing a standard of practice. The Office by means of assembled conferences or letter referenda, or both, assists the sponsor group in arriving at a tentative standard of practice and thereafter refers it to the other elements of the same industry for approval or for constructive criticism that will be helpful in making any necessary adjustments. The regular procedure of the Office assures continuous servicing of each Commercial Standard through review and revision whenever, in the opinion of the industry, changing conditions warrant such action.

The initial printing of this Standard was made possible through the cooperation of the American Hardboard Association.

Hardboard

(Effective February 11, 1963)

Reprinted April 1967 with Amendments effective November 15, 1966

1. PURPOSE

1.1 Purpose—The purpose of this Commercial Standard is to establish a nationally recognized industry standard for hardboard. It is also intended to provide an effective voluntary basis for the common understanding of those concerned with the manufacture, sale, and use of hardboard and to promote fair competition.

2. SCOPE, DEFINITION AND DESCRIPTION

2.1 Scope—This standard sets forth the standard commercial types, and sizes of hardboard, and gives information on special hardboards available. It provides specifications for physical requirements and test methods for static bending (modulus of rupture), tensile strength, water absorption, and thickness swelling. It includes a glossary of terms used in the hardboard industry, and recommends a uniform means of marking and certifying for the consumer hardboards that comply with this Standard.

2.2 Definition—Hardboard is a generic term for a panel manufactured primarily from inter-felted ligno-cellulosic fibers consolidated under heat and pressure in a hot press to a density of at least 31 pounds per cubic foot (0.497 grams per cubic centimeter).

Other materials may be added during manufacture to improve certain properties, such as stiffness, hardness, finishing properties, resistance to abrasion and moisture, as well as to increase strength, durability, and utility. (See sec. 7 for other definitions relating to the hardboard industry.) (As amended 1966.)

2.3 Description—The natural color of hardboard ranges from blond to dark brown, depending on the manufacturing process used. Hardboard is resistant to moisture and abrasion, is dense and uniform in appearance, and can be easily sawed, planed, sanded, drilled, or punched. It takes paints, and stains. It also can be nailed, screwed, stapled, or glued in place; or bent to certain degrees of contours. Hardboard may be modified to produce various decorative and embossed patterns on the hardboard surfaces.

3. CLASSIFICATION OF HARDBOARDS

3.1 Basic types—The basic commercial types of hardboard are classified as Standard, Tempered, and Service and are described below. Information on other types of hardboards, some of which are only available from certain manufacturers, and

on the intended uses of the various hardboard products is also given. Requirements for the basic hardboards are given in Table 1.

3.1.1 Standard—Standard hardboard is a product in substantially the same form as when it comes from the manufacturing press, except for minor processing steps such as humidification to adjust moisture content, and trimming to size. This is a hardboard of high strength and water resistance, and in most cases falls in a specific gravity range of 0.96 to 1.20 (60 to 75 lbs. per cu. ft.).

3.1.1.1 Use—Standard hardboard is generally suitable for applications where good machinability, finishing characteristics, strength, and water resistance are needed, such as in furniture and cabinet work.

3.1.2 Tempered—Standard hardboard which has been impregnated with a siccative material such as drying oil blends of oxidizing resin which are stabilized by baking or other heating after introduction. Tempered hardboard has substantially improved properties of stiffness, strength, hardness, and resistance to water and abrasion as compared to Standard hardboard. In most cases its specific gravity falls in the range of 1.0 to 1.20 (62 to 75 lbs. per cu. ft.).

3.1.2.1 Use—Tempered hardboard is generally suitable for use where superior strength, water resistance, machinability, finishing characteristics, and harder surface are needed. Examples of uses of this type of material are: wearing surfaces, storage bins, high quality finishing, and exterior paneling.

3.1.3 Service—This is a hardboard of moderate strength somewhat less than that of Standard hardboard. In most cases its specific gravity falls in the range of 0.80 to 0.96 (50 to 60 lbs. per cu. ft.). It is in substantially the same form as when it comes from the manufacturing press, except for minor processing steps such as humidification and trimming to size.

3.1.3.1 Use—Service hardboard is generally used where its lower weight is advantageous and where moderate machinability, finishing characteristics, water resistance, and strength are suitable. Interior paneling is an example of the use of this type of hardboard.

3.2 Other commercial hardboards—The requirements of other hardboards which are also regularly produced to meet particular requirements for certain applications are specified below. Special hardboard products which are not covered

by this standard are described in the Appendix.

3.2.1 Tempered-Service—Tempered-Service hardboard is Service hardboard which has been impregnated with a siccativ material such as drying oil blends of oxidizing resin which are stabilized by baking or other heating after introduction. Tempered-Service hardboard as described in Table 2 has substantially improved properties of stiffness, strength, hardness and resistance to water and abrasion as compared to Service hardboard.

3.2.2 Treated Hardboard—Hardboard as described in Table 3 which has been processed with special additives during manufacture or processed after manufacture with superficial surface treatments, such as with oils or resins, usually followed by heating to give moderate improvements to Standard or Service hardboards.

3.2.3 Underlayment—Hardboard meeting strength requirements of $\frac{7}{32}$ " or $\frac{1}{4}$ " Service hardboard that is planed or sanded on one side to a thickness of 0.215 ± 0.005 inch primarily for use as an underlay panel over which linoleum, asphalt tile, plastic tile, and similar floor surface materials may be applied. Usually available in 3' x 4' and 4' x 4' sizes. (As amended 1966).

3.3 Hardboard Surfaces—Hardboards are classified by surface finish into smooth-one-side (S1S) and smooth-two-sides (S2S).

3.3.1 Smooth-One-Side (Screen-Back Hardboard) (S1S)—Hardboard with a reverse impression of a screen on the back produced when a damp or wet felted fiber mat is hot-pressed between a smooth platen and a wire screen on top of the bed platen.

3.3.2 Smooth-Two-Side Hardboard (S2S)—Hardboard produced from a substantially dry fiber mat pressed between two smooth hot platens. (At the option of the purchaser, hardboard manufactured in this manner with the same physical properties as listed in Table 1 for S1S hardboard may be considered as qualifying for S1S specifications.)

3.4 Commercial Sizes—The standard commercial width of hardboard is 4'. It is also available in 5-foot widths. The standard commercial lengths are 4', 6', 8', 12', and 16'. It is also available in 18' lengths, in 4-foot widths. The commercial thicknesses are $\frac{1}{12}$ ", $\frac{1}{10}$ ", $\frac{1}{8}$ ", $\frac{3}{16}$ ", $\frac{7}{32}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", and $\frac{3}{8}$ ". All of these sizes and thicknesses are not available from all manufacturers; however, some manufacturers produce other intermediate lengths, widths, and thicknesses, which may be considered as complying with this Commercial Standard, provided the actual dimensions are clearly indicated, and the product complies with all other requirements of the standard. (As amended 1966).

3.4.1 Dimensional tolerances—Mill cutting for length and/or width shall not vary more than plus or minus $\frac{1}{16}$ " from the ordered size. Board shall be square within $\frac{1}{64}$ " per foot of lineal length or width. Thickness limits are given in Tables 1,

2, and 3, and shall be determined in accordance with paragraph 5.4.

4. REQUIREMENTS—PHYSICAL AND MECHANICAL PROPERTIES

4.1. The required limits for thickness, water absorption, thickness swelling, modulus of rupture, tensile strength parallel to surface, and tensile strength perpendicular to surface for each type of hardboard which may be labeled or otherwise designated as conforming to this Commercial Standard are specified in Tables 1, 2, and 3. These properties shall be determined and tested as specified in Section 5.

5. TEST PROCEDURES

5.1 **General**—The tests specified herein are for the purpose of determining the conformance of the product with the requirements of this standard.

The sampling and tests shall be used by the manufacturers as a part of the production quality controls, and are also recommended for use for such inspection or acceptance testing as may be required by the distributors or buyers. Each producer should, of course, take sufficient random samples of his daily production, over and above those specified below, as are needed to assure that the quality of his products marked or labeled as complying with this Standard, do, in fact, conform.

5.1.1 **Selection of samples**—Samples shall be taken at random in accordance with Table 4.

5.2 **Cutting of specimens**—Specimens shall be cut from the sample boards as shown in Figure 1. Every effort shall be made to secure a uniformly smooth saw cut. It is recommended that a 40-80 tooth (carbide) finish saw operated at approximately 3,600 r.p.m. on an overhead saw, or its equivalent, be used, with the bed plate as near the sawblade as possible to reduce chipping and fuzzing of the lower edge.

5.2.1 In those tests that are affected by machine direction, such as the static bending and tensile strength parallel to the surface, the specimens shall be taken in equal number from each direction. The average result of the test values on all of these specimens in each test shall be considered the true value for the property being tested when comparing it with the required property as specified in Tables 1, 2, and 3.

5.2.2 All test specimens shall be cut as accurately as possible to the dimensions specified for each test. The following shall be the accuracy limits for all specimens, unless otherwise specified in the applicable test procedure:

Surface measurements.....	To the nearest 0.01 inch.
Thickness measurements....	To the nearest 0.001 inch.
Weight.....	To the nearest 0.1 gram.
Load.....	Unless otherwise specified, to the nearest pound.

5.3 **Conditioning of specimens**—Except in cases of dispute, all material shall be tested as received. In cases of disputes, all material shall

TABLE 1.—Detail requirements of basic hardboards

Classification	Surface	Nominal thickness designations	Thickness limits (minimum-maximum average per panel)	Modulus of rupture (minimum average per panel)	Tensile strength (minimum average per panel)		Water resistance	
					*	* ⊥	Water absorption (maximum per panel)	Thickness swelling (maximum per panel)
Standard	S1S	<i>Inch</i>	<i>Inch</i>	<i>P.s.i.</i>	<i>P.s.i.</i>	<i>P.s.i.</i>	<i>Percent</i>	<i>Percent</i>
		1/2	0.070-0.090	5,000	2,500	100	43	30
		5/16	.090-.110				25	22
		3/8	.115-.155				20	16
		5/16	.170-.205				18	14
		1/4	.225-.265				16	12
		3/16	.290-.335				14	10
	S2S	5/16	.090-.110	5,000	2,500	100	30	25
		3/8	.115-.155				25	18
		5/16	.170-.205				25	18
		1/4	.225-.265				18	14
		5/16	.290-.335				15	12
		3/8	.350-.400				12	10
Tempered	S1S	3/8	0.115-0.155	7,000	3,500	150	15	11
		5/16	.170-.205				12	10
		1/4	.225-.265				10	8
	S2S	3/8	.115-.155	7,000	3,500	150	15	15
		5/16	.170-.205				15	12
		1/4	.225-.265				12	12
Service	S1S	3/8	0.115-0.155	3,000	1,500	50	30	25
		5/16	.170-.205				25	15
		1/4	.225-.265				25	15
		3/8	.350-.400				25	15
	S2S	3/8	.115-.155	3,000	1,500	50	30	25
		5/16	.170-.205				27	25
		7/32	.205-.250				27	25
		1/4	.225-.265				27	25

*NOTE: || Parallel to surface. ⊥ Perpendicular to surface.

TABLE 2.—Requirements of tempered-service hardboards

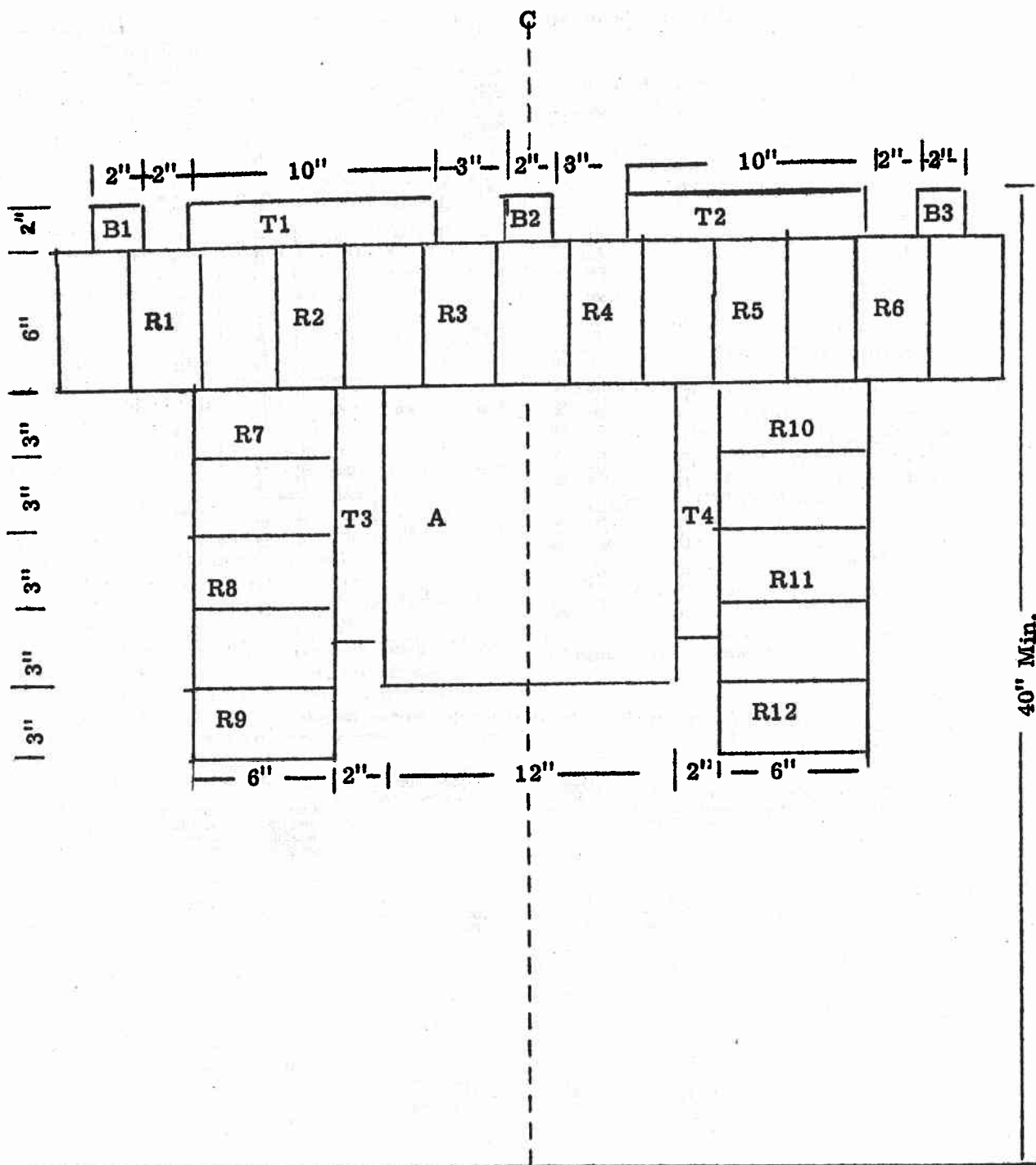
Surface	Nominal thickness designation	Thickness limits (minimum-maximum average per panel)	Modulus of rupture (minimum average per panel)	Tensile strength (minimum average per panel)		Water resistance	
				*	* ⊥	Water absorption (maximum per panel)	Thickness swelling (maximum per panel)
S1S	<i>Inch</i>	<i>Inch</i>	<i>P.s.i.</i>	<i>P.s.i.</i>	<i>P.s.i.</i>	<i>Percent</i>	<i>Percent</i>
S2S	3/8	0.350-0.400	5,200	2,000	75	14	10
	7/32	.205-.250	5,200	2,000	75	20	16

*NOTE: || Parallel to surface. ⊥ Perpendicular to surface.

TABLE 3.—Requirements of treated hardboards

Surface	Nominal thickness designation	Thickness limits (minimum-maximum average per panel)	Modulus of rupture (minimum average per panel)	Tensile strength (minimum average per panel)		Water resistance	
				*	* ⊥	Water absorption (maximum per panel)	Thickness swelling (maximum per panel)
S1S	<i>Inch</i>	<i>Inch</i>	<i>P.s.i.</i>	<i>P.s.i.</i>	<i>P.s.i.</i>	<i>Percent</i>	<i>Percent</i>
	1/2	0.115-0.155	5,000	2,000	75	18	15
	5/16	.170-.205	5,000	2,000	75	18	15
	1/4	.225-.265	5,000	2,000	75	18	15
S2S	1/2	.115-.155	5,000	2,000	75	20	16
	5/16	.170-.205	5,000	2,000	75	20	16
	1/4	.225-.265	5,000	2,000	75	20	16

* Note: || Parallel to surface. ⊥ Perpendicular to surface.



END OF PANEL

A—Water Absorption and thickness swelling.
 R—Static Bending (Modulus of Rupture) and thickness.
 T—Tensile Strength Parallel to the surface.
 B—Tensile Strength Perpendicular to the surface.

Scale 2 In.=1 Ft.

FIGURE I—Test specimen cutting diagram.

TABLE 4.—Sample selection for testing

Number of boards in lot	Number of sample boards for determining conformance
100 or less.....	1
101 to 1,000.....	2
Over 1,000.....	3

be conditioned to constant weight prior to testing at a dry-bulb temperature of 72° F ±2° and a relative humidity of 50% ±2%.

5.4 Thickness Measurement.

5.4.1 Apparatus—A micrometer reading to the nearest 0.001 in. and having an anvil surface and pressing foot at least 7/16 in. in diameter shall be used.

5.4.2 Test Specimen—The thickness shall be the average of readings at locations representative of the entire panel area. When modulus of rupture tests are performed, the average of the caliper readings obtained for that purpose may be taken as the caliper of the specimen. If modulus of rupture tests are not taken, the thickness shall be obtained by caliper readings taken at the same locations given on the Cutting Diagram (fig. 1) for the modulus of rupture specimens.

5.4.3 Procedure—All readings shall be taken at least 1 in. from the specimen edge using 7–12 psi on the anvil surface to assure contact over the entire pressing foot. When using conditioned board the readings shall be taken within as short a time as is possible after the material has been removed from the conditioning chamber.

5.4.4 Report—The report shall contain the average of the test values of all the representative specimens as secured for the panel.

5.5 Water Absorption.

5.5.1 Apparatus—The test requires a constant-temperature water bath sufficiently large to accommodate a number of 12" x 12" samples in a horizontal plane submerged 1 inch beneath the water surface. The water shall be fresh, circulating and maintained at 70° F ±2°. A balance sufficiently accurate to weigh the specimen to the nearest 0.1 gram shall be used.

5.5.2 Test Specimen—The test specimen shall be taken from the location shown in the Cutting Diagram (fig. 1) and shall be 12 by 12 in.¹

5.5.3 Procedure—The specimen shall be weighed to the nearest 0.1 gram, and submerged at 70° F ±2°. The specimen shall be supported so as to permit exposure of both surfaces to circulating fresh water. After 24 hours of continuous soaking, the specimen shall be removed from the water, placed on edge, and permitted to drain for ten min. After this 10 min. drain, the excess water shall be removed by hand with blotting

paper or a paper towel, and the specimen immediately weighed.²

5.5.4 Calculation—The following formula shall be used to calculate the percent of water absorption:

$$A = \left(\frac{W_2}{W_1} - 1.0 \right) \times 100 \text{ or } \frac{(W_2 - W_1)}{W_1} \times 100$$

Where: A = percent absorption
 W_1 = original weight, grams,
 W_2 = final weight, grams

5.5.5 Report—The absorption shall be reported as the percent by weight of water taken up based on the original weight of the specimen.

5.6 Thickness Swelling.

5.6.1 Apparatus—See par. 5.5.1 Water Absorption Apparatus, and par. 5.4.1, Thickness Measurement Apparatus.

5.6.2 Test Specimen—Unless otherwise specified, this test may be carried out at the same time and using the same test specimen as is used for the water absorption tests, par. 5.5.2 Water Absorption Test Specimen.

5.6.3 Procedure—The thickness shall be determined to the nearest 0.001 in. by averaging four readings taken at the center of each side of the specimen, and 1 in. from the edge. The caliper reading is taken after 7–12 psi is applied to the anvil foot. These points shall be marked in such a manner that they can be established exactly after soaking. The specimen shall be soaked and treated in the same manner as established in par. 5.5.3 Water Absorption Procedure. Immediately following the test, the specimens shall be re-calipered in exactly the same locations and manner, and an average reading established for each soaked specimen. In the event of a dispute the procedural changes as established in footnote 2 of par. 5.5.3 Water Absorption Procedure shall be used.

5.6.4 Calculation—The following formula shall be used when calculating the percent of swelling:

$$S = \left(\frac{D_2}{D_1} - 1.0 \right) \times 100$$

Where: S = percent swelling
 D_1 = average thickness before soaking, inches
 D_2 = average thickness after soaking, inches

5.6.5 Report—The swelling shall be reported as the average percent increase in thickness based on the original thickness of the specimen.

¹ A specimen 6 by 6 in. may be used if desired. The specimen must be taken from the same area as established on the cutting diagram.

² In case of dispute, the following are the changes that shall be made in the above procedure: 1. Distilled water shall be used in the water bath. 2. The specimens shall be conditioned prior to test as outlined in par. 5.3 Conditioning of the specimens.

5.7 Modulus of Rupture (Static Bending).

5.7.1 **Apparatus**—An ordinary static-testing machine equipped with a head for center-loading transverse strength test specimens shall be used. The machine must be equipped for variable head speeds so that the required rate of loading can be obtained. The weighting system shall be sufficiently accurate to obtain load readings to the nearest two pounds of the maximum load over 100 lbs., and to within 1 lb. on loads less than 100 lbs.

5.7.2 **Test Specimen**—The test specimen shall be 3 by 6 inches and shall be measured to the nearest 0.01 inch in width at the point of load application.

5.7.3 **Span and Support**—The support and crosshead shall be rounded to a radius not less than $\frac{3}{16}$ " nor more than $\frac{3}{8}$ ". The span shall be four inches from center to center of the supports. (As amended 1966.)

5.7.4 **Thickness**—The apparatus and procedure as established in par. 5.4.1 and 5.4.3 (Thickness Apparatus and Procedure) shall be used. All thicknesses shall be to the nearest 0.001 in. and shall be the average of two readings taken approximately 1 in. from each edge of the specimen at the point of load application.

5.7.5 **Loading**—The specimen shall be centered flatwise on the parallel supports at least as long as the specimen is wide. When testing S1S boards, the specimen shall be so placed that the screen or rough side is on the tension side (usually down in the machine).

5.7.6 **Speed of testing**—The load shall be applied continuously at midspan by a crosshead at least as long as the specimen is wide, parallel to the end supports, and traveling at an approximately uniform rate not less than 0.5 inch per min., nor greater than 1.0 inch per min. This speed is the differential speed between the crosshead and the supports. (As amended 1966.)

5.7.7 **Calculation**—The breaking load, or flexural strength, shall be recorded to the nearest lb. if less than 100 lb. and to the nearest 2 pounds if more than 100 lb. The modulus of rupture shall be calculated from the following formula:

$$R = \frac{3}{2} \frac{pl}{bd^2}$$

Where:

R = modulus of rupture, psi
 p = breaking load, lb.
 l = length of span, in.
 b = width of specimen, in.
 d = thickness of specimen, in.

5.7.8 **Report**—The modulus of rupture for the panel shall be the average of six tests on specimens in the long dimension and tests on six specimens at right angles thereto.

5.8 Tensile strength parallel to the surface.

5.8.1 **Apparatus**—A static-testing machine as outlined in par. 5.7.1 (Modulus of Rupture "Static Bending Apparatus") and equipped with tensile

grips having serrated gripping surfaces at least 2 in. wide and 2 in. long shall be used.

5.8.2 **Test Specimen**—The test specimen shall be 2 in. wide and at least 10 in. long. The specimens shall be cut from the designated locations as shown on the Cutting Diagram (Figure 1). A reduced center section $1\frac{1}{2}$ " wide shall be sawed with a bandsaw as shown in Figure 3 of ASTM Specification D-1037, Methods of Test for Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials.³

5.8.3 **Procedure**—The thickness of the specimens shall be measured to the nearest 0.001 in. using the method outlined in par. 5.4.3 Thickness Procedure and the width of the specimen shall be measured to the nearest 0.01 in. at the center of the specimen. The specimen shall be placed in the tensile jaws in such a manner as to provide a clear length of six in. between the two jaws. The load shall be applied continuously at a uniform movable cross head speed of 0.125–0.175 in. per min. If failure occurs within one-half in. of either grip, then the test value shall be discarded and the test shall be re-run on a new specimen from the same area. The breaking load shall be recorded to the nearest 1 percent.

5.8.4 **Calculation**—The tensile strength shall be calculated from the following formula:

$$T = \frac{p}{bd}$$

Where:

T = tensile strength parallel to the surface, psi.
 p = breaking load, lb.
 b = width of specimen, in.
 d = thickness of specimen, in.

5.8.5 **Report**—The tensile strength parallel to the surface shall be the average of the four tests and be reported to the nearest 100 pounds per square inch.

5.9 Tensile Strength Perpendicular to the Surface.

5.9.1 **Apparatus**—A static-testing machine as outlined in par. 5.7.1 Modulus of Rupture 'Static Bending Apparatus' and equipped with self-aligning heads shall be used for this test. A number of metal loading blocks 2 in. square and approximately 1 in. in thickness are required.

5.9.2 **Test Specimen**—The test specimens shall be 2 in. \pm 0.01 in. square, and shall be taken as established in the Cutting Diagram (Figure 1). Light sanding of the face and back of the material may be necessary to insure good adhesion of the hardboard to the test blocks.

5.9.3 **Procedure**—Each specimen shall be glued flatwise between two test blocks, with an adhesive which shall be a suitable material to

³ Copies of the latest edition of the American Society for Testing and Materials standard, D-1037, can be obtained from the Society's offices at 1916 Race Street, Philadelphia, Pa. 19103.

effectively bond metal and specimen without affecting the internal strength of the specimen.⁴ The direction of loading shall be perpendicular to the faces of the specimen with the center of the load passing through the center of the specimen. The specimen shall be stressed by separation of the heads of the testing machine such that the piece is pulled apart in tension. The load shall be applied at a constant speed of 0.125–0.175 in. per min. until failure occurs. Those specimens which show less than 95 percent fiber pull shall be discarded and another check made at this point.

5.9.4 **Calculation**—The test values shall be calculated in psi of surface area using the following formula:

$$B = \frac{p}{4}$$

Where:

B = tensile strength, psi.

p = breaking load, lb.

5.9.5 **Report**—The load perpendicular to the surface shall be reported as the average of the three tests for each panel in psi. The values shall be given to the nearest pound.

6. GRADE MARKING AND CERTIFICATION

6.1 **Grade Marking of each panel**—Each panel of hardboard marketed as complying with the requirements of this Commercial Standard may be clearly grade marked with all of the following information:

- (1) The manufacturers' name and address or his readily recognized trade mark or brand.
- (2) The full symbol of the Commercial Standard (CS251-63).
- (3) The specific type of hardboard being grade marked and certified.

6.2 **Certification of Shipments**—In order to assure the purchaser that he is getting hardboard conforming to the requirements of this Commercial Standard, it is recommended that producers, either individually or in concert with their trade association or with testing laboratories, issue a certificate with each shipment including the following wording (also see the Appendix):

"This _____ type hardboard conforms to the requirements of Commercial Standard CS251-63 (amended 1966) as developed under the procedures of the National Bureau of Standards, United States Department of Commerce."

(Manufacturer's name)

7. GLOSSARY OF HARDBOARD INDUSTRY TECHNICAL TERMS

Core—The innermost portion of a laminated panel, or substrate overlaid with plastic or fine wood surfaces in furniture and cabinet work.

⁴ The following adhesive formulations or equivalents will meet the requirements of par. 5.9.3:

Shell Epon Resin 100	100	parts by wt.
Shell "T" hardener	21	parts by wt.
Cab-O-Sil M5	10	parts by wt.

Density—The weight of hardboard in relation to its volume, usually expressed as pounds per cubic foot.

Hardboard—See par. 2.2.

Hot pressed—Process of compressing a wood fiber mat between heated platens to form hardboard.

Humidification—The process of adding moisture to board.

Lignin—Wood's natural binding agent; the cementing bond that holds the wood fibers together.

Platen—The heated plate between which wood fiber mats are consolidated into hardboard.

Siccative Drying—As in drying oil.

APPENDIX

Special Hardboard Products—Hardboard is also produced in a variety of special products as listed below, which are especially designed for such purposes as convenience of application, decorative effect, and particular engineering requirements. These special products may be produced from basic hardboard defined and specified in Sections 3.1.1 to 3.2.3, inclusive. When this is so, the manufacturer may state and mark that the special product is "Made from Standard, Tempered, Service, Tempered-service, Treated or Underlayment quality hardboard." However, information and specifications for final properties, surface treatment, or glue line strengths of these special products are not covered by this standard and must be obtained from individual manufacturers. A number of these special products which are available from one or more manufacturers are briefly described as follows:

(A) **Textured Hardboards**—Hardboards which have a surface texture or pattern which has been pressed or machined into the surface, such as:

- (a) **Tile Pattern**—Tempered S2S or S1S hardboard having pressed or mechanically scored grooves, usually spaced 4" on center each direction forming 4" squares on one surface. Usually available in 1/8" and 3/16" thicknesses.
- (b) **Embossed Patterns**—Hardboard which has a pattern impressed into one surface. Among the patterns available are simulated leather, wood grain, and basket weave.
- (c) **Striated Pattern**—Hardboard which has a surface similar to combed wood, achieved either by pressing or by machining after pressing.
- (d) **Grooved Hardboard**—Hardboard having uniform or random scoring or grooving for decorative purposes.

(B) **Factory Finished Hardboards**—Hardboards which have a factory applied finish, such as:

- (a) **Decorative Printed Hardboard**—Hardboard with wood grain or other design printed on the board surface. This

product is often produced with decorative grooving.

- (b) **Primed or Coated Hardboard**—Hardboard on which a paint material or other coating has been applied to a discernable film thickness for decorative or protective purposes or as a base for customer finishing.
- (c) **Factory Sealed or Filled Hardboard**—Hardboard with a sealing or filling material incorporated in the board surface for improved stain resistance, finishing characteristics, and/or decorative purposes. These products are often grooved or perforated.

(C) **Perforated Hardboards**—Hardboards with factory punched holes which may be used with various fixtures to provide decorative wall mounted-storage facilities, or which may be used for acoustical purposes.

(D) **Decorative Laminate Core**—Hardboards manufactured to provide a core for high pressure decorative laminates and which are characterized by a high perpendicular tensile strength and a smooth surface. They are usually sanded or planed for uniform thickness.

(E) **Laminated Hardboards**—Hardboards laminated with an adhesive in multiple plies to obtain greater thickness. These products are used for special purposes where added thickness or two smooth surfaces are desired. Laminated hardboards are available for interior and exterior use.

(F) **Siding**—Certain hardboards are specially manufactured for use as siding on buildings. Siding usually has a minimum thickness of $\frac{1}{4}$ " but is available in thicknesses up to $\frac{3}{16}$ ". Siding is available in strips 8" or wider and in lengths up to 16 or more for application as lap siding, and in panels 4' wide and up to 16' long or more for application as panel siding. Lap siding may have an integral or separate wood shadow strip and may be installed by nailing, or may have special design features to permit installation with hidden fastenings. Siding may be plain or have a surface pattern or texture for decorative purposes, along with machined edges to provide ship-lap or other joint treatment. Factory primed siding and prefinished sidings are also available. (As amended 1966).

(G) **Concrete Form Hardboards**—Usually tempered hardboards which have been given additional processing to provide maximum performance when used as panels and liners in concrete form work. Usually made in $\frac{1}{4}$ " thickness.

PACKING (UNITIZING)

Hardboards are usually supplied either paper wrapped or in palletized units.

APPLICATION

Application Instructions—It is recommended that hardboard be applied or installed and used in accordance with the individual manufacturer's recommendations for the specific purpose intended.

HISTORY OF PROJECT

In a letter dated January 4, 1962, addressed to the Commodity Standards Division (now Product Standards Section, Office of Engineering Standards Services, National Bureau of Standards), U.S. Department of Commerce, the American Hardboard Association requested the establishment of a Commercial Standard for Hardboard. A draft of the standard was submitted with the request, and was edited by the Division, and reviewed by the Forest Products Laboratory. Adjustments were made and on August 6 a Proposed Commercial Standard, TS-5593, was circulated to representative industry groups for consideration and comment. Additional minor adjustments were suggested by the AHA based on the comment received, and a Recommended Commercial Standard, TS-5593A, was widely circulated to the trade for acceptance.

Endorsements in the form of signed acceptances from individual producers, distributors, and users of hardboard were considered sufficiently representative of the industry to insure successful application of the standard. Accordingly, on January 11, 1963, the establishment of the new Commercial Standard was announced by the Department. It was designated CS251-63, and was made effective for new production on February 11, 1963. An amendment was approved by the Standing Committee, and was circulated to all recorded acceptors on October 14, 1966. In the absence of any objections, the Amendments (as noted herein) were made effective on November 15, 1966. (As amended 1966.)

Project Manager: Wm. H. Furcolow, Product Standards Section, Office of Engineering Standards Services, National Bureau of Standards, U.S. Department of Commerce.

Technical Adviser: Wayne C. Lewis, Division of Wood Engineering Research, Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, Madison, Wis.

STANDING COMMITTEE

The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Comment concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Product Standards Section, Office of Engineering Standards Services, National Bureau of Standards, U.S. Department of Commerce which acts as secretary for the committee.

Representing Manufacturers:

Mr. George B. Matter, Weyerhaeuser Co., P.O. Box 1139, Longview, Wash. 98632 (Chairman)
 Mr. R. W. Jindrich, Masonite Corp., 29 N. Wacker Drive, Chicago, Ill. 60606
 Mr. H. M. Ely, U.S. Plywood Corp., P.O. Box 210, Hood River, Oreg. 97031

Representing Users:

Mr. R. W. Muth, K. M. Muth Co., 2021 North Avenue, Sheboygan, Wis.

Mr. Robert L. Day, Overhead Door Corp., Hartford City, Ind.

Mr. Wayne A. Norman, Caradco, Inc., 11th and Jackson Sts., Dubuque, Iowa 52001

Representing Distributors:

Mr. R. H. Marack, Alexander Warehouse and Sales Co., 105 West Adams St., Chicago, Ill. 60603

Mr. Joseph C. L. Evans, Evans Lumber Co., 1698 Genesee St., Buffalo, New York 14211

Mr. Harold W. Sparks, Lumberyard Supply Co., 5060 Manchester Ave., St. Louis, Mo. 63110

ACCEPTORS

The manufacturers, distributors, users, and others listed below have individually indicated in writing their acceptance of this Commercial Standard prior to its publication. The acceptances indicate an intention to utilize the Standard as far as practicable, but reserve the right to depart from it as may be deemed desirable. The list is published to show the extent of recorded public support for the Standard, and should not be construed as indicating that all products made by the acceptors actually comply with its requirements.

Products that meet all requirements of the standard may be identified as such by a certificate, grade mark, or label. Purchasers are encouraged to require such specific representation of compliance, which may be given by the manufacturer whether or not he is listed as an acceptor. (As amended 1966).

TRADE ASSOCIATIONS (General Support)

American Hardboard Association, Chicago, Ill.
 American Specification Institute, Chicago, Ill.
 The Associated General Contractors of America, Washington, D.C.
 Hardwood Plywood Manufacturers Association, Arlington, Va.
 Home Manufacturers Association, Washington, D.C.
 Insulation Board Institute, Chicago, Ill.
 The Michigan Association Traveling Lumber Sash & Door Salesmen, Detroit, Mich.
 Mississippi Retail Lumber Dealers Association, Inc., Jackson, Miss.
 National Building Material Distributors Association, Chicago, Ill.
 Western Wood Products Association, Portland, Oreg.
 Woodwork Institute of California, Fresno, Calif.

PRODUCERS

Abitibi Corp., Alpena, Mich.
 Ampac Hardboard Co., Conway, N.C.
 Bowater Board Co., Catawba, S.C.
 Evans Products Co., Corvallis, Oreg.
 Forest Fiber Products Co., Forest Grove, Oreg.
 Georgia-Pacific Corp., Portland, Oreg.
 Hines, Edward, Lumber Co., Chicago, Ill.
 Masonite Corp., Chicago, Ill.
 Nu-Ply Corp., Bemidji, Minn.
 Superwood Corp., Duluth, Minn.
 Superwood Corp. of Arkansas, North Little Rock, Ark.
 United States Gypsum Co., Chicago, Ill.
 United States Plywood Corp., Lebanonite Div., Lebanon, Oreg.
 Weyerhaeuser Co., Tacoma, Wash.
 Wood Conversion Co., St. Paul, Minn.

DISTRIBUTORS

American Door Distributors, Inc., Watertown, Mass.
 Baxter, C. B., & Co., Kansas City, Mo.
 Certain-teed Products Corp., Ardmore, Pa.
 Donlin Co., St. Cloud, Minn.
 Flint Sash & Door Co., Inc., Flint, Mich.
 Harbor Sales Co., Inc., Baltimore, Md.
 Hines, Edward, Lumber Co., Skokie, Ill.
 Hutter, J. B. & C. A., Corp., Lynchburg, Va.
 Jenkins Wholesale Supply Co., Inc., North Wilkesboro, N.C.
 Johns-Manville Products Corp., Manville, N.J.
 Lank Woodwork Co., Inc., Washington, D.C.

Lumber Products, Portland, Oreg.
 Lumbermens Merchandising Corp., Wayne, Pa.
 MacKinney Co., Dundee, Ill.
 Master Woodcraft Inc., Brooklyn, N.Y.
 May Plywoods Inc., Chicago, Ill.
 National Lumber, Inc., North Haven, Conn.
 New England Hardboard Co., Inc., Worcester, Mass.
 Oklahoma Sash & Door Co., Oklahoma City, Okla.
 Partridge Lumber Sales Co., Minneapolis, Minn.
 Pioneer Wholesale Supply Co., Salt Lake City, Utah
 Pionite Plastics & Plywood, Inc., Westlake, Ohio
 Ramsey, A. H. and Sons, Inc., Miami, Fla.
 Sears, Roebuck and Co., Chicago, Ill.
 Simpson International, Shelton, Wash.
 Simpson Timber Co., Seattle, Wash.
 Spiegel, Inc., Chicago, Ill.
 Vista-Lux Hardboard Co., Baltimore, Md.
 Whitmer-Jackson Co., Inc., Buffalo, N.Y.
 Woodpanel, Inc., Los Angeles, Calif.
 Zwart, H., and Co., Los Angeles, Calif.

USERS

Abugel, Fred., Woodhaven, N.Y.
 Angel Co., Inc., Fitchburg, Mass.
 Barclay Manufacturing Co. Inc., New York, N.Y.
 Bestile Manufacturing Co., Ontario, Calif.
 Bickford, Robt. T., Elmira, N.Y.
 Boston Milling Co., Dorchester, Mass.
 Cortland Industries, Inc., Chicago, Ill.
 Davis Manufacturing Co., Inc., New Orleans, La.
 Detroit Edison Co., Detroit, Mich.
 Emery Industries, Inc., Cincinnati, Ohio.
 Erickson, Ernest L., Rutland, Vt.
 Florida Made Door Manufacturing Co., Orlando, Fla.
 Glenwood Lumber Co., Bridgeport, Conn.
 H & S Lumber Co., Charlotte, N.C.
 Haley Bros., Santa Monica, Calif.
 Hardboard Fabricators Corp., Newark, N.J.
 Loughman Cabinet Co., St. Louis, Mo.
 Mason City Millwork Co., Mason City, Iowa
 Midwest Manufacturing Co., St. Louis, Mo.
 Monarch Door Sales Inc., Tacoma, Wash.
 Morgan Co., Oshkosh, Wis.
 Nixon Lumber Co., Inc., Memphis, Tenn.
 Parish, Archie G., Architect, St. Petersburg, Fla.
 Ready Hung Door Corp., Fort Worth, Tex.
 Roseburg Lumber Co., Dillard, Oreg.
 Smith and Williams, South Pasadena, Calif.
 Superior Woodwork Co., San Antonio, Tex.
 United Wood Products Co., Inglewood, Calif.
 Vogel, Willis A., Architect, Toledo, Ohio

Wallace Manufacturing Co., North Kansas City, Mo.
Washington Woodworking Co., Inc., Washington, D.C.
Welch, Carroll E., Architect, Huntington, N.Y.
Western Electric Co., Dept. 8155, Kearny, N.J.

GENERAL INTERESTS

Arco Paint Div., Martin Marietta Corp., Cleveland, Ohio
Carlow Co., Colton, El Monte, Los Angeles, Niland, and
Pacoima, Calif.
Elmendorf Research, Inc., Palo Alto, Calif.
Interchemical Corp., Finishes Div., Cincinnati, Ohio
North Carolina State College, School of Forestry, Raleigh,
N.C.

Patzig Laboratories, Des Moines, Iowa
W/S Precision Finishing Corp., Dallas, Tex.

U.S. GOVERNMENT AGENCIES

Commerce, Department of, U.S. Weather Bureau, Wash-
ington, D.C.
General Services Administration, Washington, D.C.
Health, Education, and Welfare, Department of, Wash-
ington, D.C.
Interior, Department of the, Washington, D.C.
Post Office Department, Washington, D.C.
Veterans Administration, Washington, D.C.

WITHDRAWN

ACCEPTANCE OF COMMERCIAL STANDARD

CS251-63 Hardboard

(As amended 1966)

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this Commercial Standard.

Date _____

Product Standards Section
Office of Engineering Standards Services
National Bureau of Standards
Washington, D.C. 20234

Gentlemen:

We believe that this Commercial Standard constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the
production¹ distribution¹ purchase¹ testing¹
of this commodity.

We reserve the right to depart from the standard as we deem advisable.

We understand, of course, that only those articles which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer _____

(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer _____

Organization _____

(Fill in exactly as it should be listed)

Street address _____

City, State, and ZIP code _____

¹ Underscore the applicable words. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interest, trade associations, trade papers, etc., desiring to record their general support, the words "General support" should be added after the signature.

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial Standards (now called Product Standards) are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of Commercial Standards is to establish, for specific commodities, nationally recognized grades or consumer criteria, and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the standard, where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function, performed by the Department of Commerce in the voluntary establishment of Commercial Standards on a nationwide basis is fourfold: First, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active, valid opposition, the success of the project is announced. If, however, in the opinion of the standing committee or of the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold publication.